SHORT REPORT

Is there still a place for emergency department thrombolysis following the introduction of the amended Joint Royal Colleges Ambulance Liaison Committee criteria for thrombolysis?

N R Castle, R C Owen, M Hann

Emerg Med J 2007;**24**:843–845. doi: 10.1136/emj.2007.049031

Objective: To apply the current (2004) and the amended (2006) Joint Royal Colleges Ambulance Liaison Committee (JRCALC) criteria for paramedic initiated thrombolysis to all patients who received thrombolytic treatment in an emergency department (ED) to determine if the amendments increase the proportion suitable for paramedic initiated thrombolysis.
Design: Retrospective descriptive analysis.
Method: The ED clinical notes, ambulance clinical record and the first recorded ECG (ED or ambulance) of all patients thrombolysed in the ED during a 12 month period were reviewed against the previous JRCALC guidelines (2004) and the amended JRCALC guidelines (2006) for thrombolysis.
Results: Using the JRCALC guidelines (2004), 26 of the 147 patients (17.7%) were eligible for paramedic initiated thrombolysis. Using the JRCALC guidelines (2006), this increased to 41 (27.9%). This difference was statistically significant (McNemar's χ^2 test with 1 degree of freedom = 15.00; $p<0.001$). The change to the blood pressure, age and pulse rate parameters has increased the percentage eligible for paramedic initiated thrombolysis by 10.2% (95% confidence interval 4.6% to 15.8%).
Conclusion: The amended JRCALC guidelines (2006) for paramedic initiated thrombolysis have successfully increased the proportion of patients suitable for prehospital thrombolysis by approximately 10%, although the ED retains an important role in the provision of prompt thrombolytic treatment for a proportion of patients.

Early thrombolysis following acute myocardial infarction is a government priority.[1] We recently demonstrated that approximately 14% of patients thrombolysed in an accident and emergency (A&E) department were eligible for prehospital thrombolysis (PHT) using the Joint Royal Colleges Ambulance Liaison Committee (JRCALC) prehospital thrombolysis criteria.[2] While the initial criteria used by JRCALC were consistent with criteria used by other paramedic based thrombolysis services,[3 4] a significant number of patients were being excluded from treatment. The majority of patients were excluded because of age (>75 years), hypertension (>160 mm Hg systolic blood pressure) or delayed presentation (>6 h after onset of symptoms). The adoption of these guidelines has allowed the judicious introduction of paramedic initiated thrombolysis to the point where most UK ambulance services are involved in either prehospital thrombolysis or prehospital triage for urgent primary percutaneous coronary intervention.

The latest prehospital thrombolysis guidelines (JRCALC 2006) now reflect the European Society of Cardiology recommendations regarding blood pressure (systolic <180 mm Hg and diastolic <110 mm Hg) and accepted practice with regards to upper age limit (<80 years).[5] While our previous research showed that 63% of patients had multiple contraindications to prehospital thrombolysis, our hypothesis for this investigation was that the amendments to the guidelines would increase the proportion of patients eligible for prehospital thrombolysis (a decrease would be impossible given that the JRCALC guidelines 2004 are effectively a subset of the JRCALC guidelines 2006).[2]

METHODS

A total of 147 patients received thrombolytic treatment in the ED at Frimley Park Hospital Foundation NHS Trust between 1 January and 31 December 2005. The A&E clinical notes, ambulance clinical record and initial electrocardiogram (ECG) of all eligible patients were reviewed against the then existing (2004) and amended (2006) JRCALC guidelines to determine whether the patients would have been suitable for paramedic initiated thrombolysis.

Statistical analysis

To test the null hypothesis of no difference in the proportion of patients eligible under each set of guidelines, we conducted McNemar's test for paired proportions. This was performed using Stata 9 statistical analysis software.[6] The figures were produced using SPSS Version 15.0.[7]

RESULTS

Using the JRCALC guidelines (2004), 26 of the 147 patients (17.7%) were eligible for paramedic initiated thrombolysis. Using the JRCALC guidelines (2006), this increased to 41 (27.9%) (see table 1 for comparison). This difference was significant (McNemar's χ^2 test with 1 degree of freedom = 15.00; $p<0.001$). The change to the blood pressure, age and pulse rate parameters has increased the percentage eligible for paramedic initiated thrombolysis by 10.2% (95% confidence

Table 1 Cross tabulation of PHT eligibility between JRCALC 3.0 and JRCALC 4.0

	JRCALC 4.0 guidelines		
JRCALC 3.0 guidelines	Eligible	Not eligible	Total
Eligible	26	0	26
Not eligible	15	106	121
Total	41	106	147

Abbreviations: A&E, accident and emergency; ECG, electrocardiogram; ED, emergency department; JRCALC, Joint Royal Colleges Ambulance Liaison Committee; PHT, prehospital thrombolysis

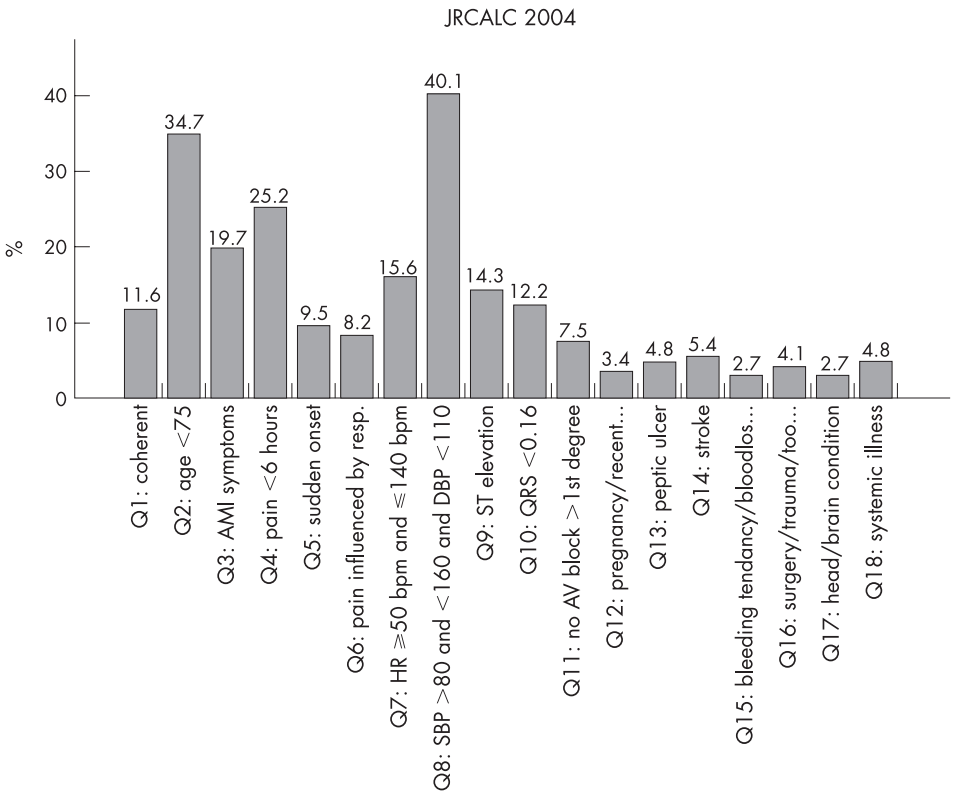

Figure 1 Percentage of patients excluded from prehospital thrombolysis by each guideline question JRCALC 2004. AMI, acute myocardial infarction; AV, atrioventricular; DBP, diastolic blood pressure; HR, heart rate; SBP, systolic blood pressure.

interval 4.6% to 15.8%) (see figs 1 and 2 for detail of the contribution of each criterion to patient exclusion).

Despite the pronounced increase in suitable patients for PHT, the ED retains an important role in delivering thrombolytic treatment as 21.8% of patients self presented and 32.7% of patients were delivered to hospital by non-paramedic ambulance crews and therefore could not have been administered PHT. Furthermore, 14.3% of initial ECGs were non-diagnostic of an ST elevation myocardial infarction, 19.7% of patients had atypical symptoms, 12.2% of patients presented with left bundle branch block, and 7.5% of patients presented in complete heart block (typically in association with inferior infarction).

A number of these patients require specialist consultation or further investigations before thrombolysis and as such would in all likelihood remain beyond the scope of PHT. Patients in

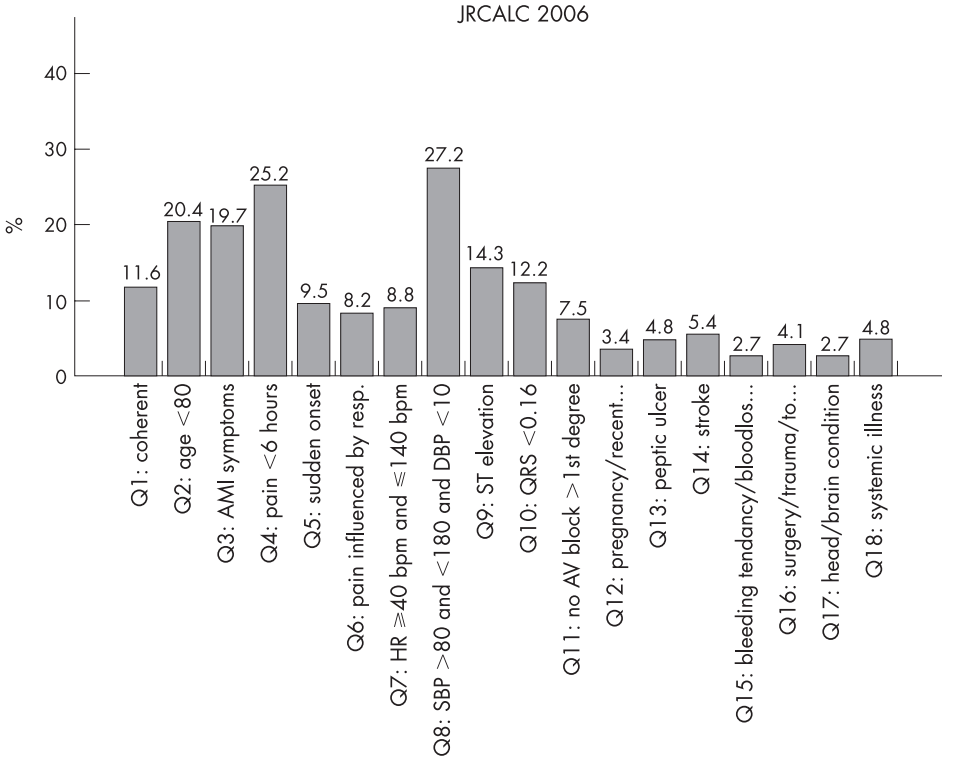

Figure 2 Percentage of patients excluded from prehospital thrombolysis by each guideline question JRCALC 2006. AMI, acute myocardial infarction; AV, atrioventricular; DBP, diastolic blood pressure; HR, heart rate; SBP, systolic blood pressure.

complete heart block following inferior infarction benefit from early reperfusion, and as such, the training, operational and patient safety implications of extending PHT to these ''atypical'' patients should be explored.

DISCUSSION

Increasing the number of patients eligible for prehospital thrombolysis should result in more patients receiving thrombolysis within 2–3 h of onset of symptoms, a timeframe in which the benefits of thrombolysis are well established.[8–11] It is noteworthy that 75% of patients in this group were treated within 3 h of onset of symptoms through a combination of PHT, hospital thrombolysis supported by pre-hospital ECG, and rapid assessment in the ED. The remainder, presenting after 3 h from symptom onset, would have benefited from primary angioplasty if it was available.[9]

A large proportion of patients remain beyond the current scope of PHT and while future amendments to the JRCALC guidelines may further increase the proportion of patients suitable for PHT, the ED will retain a role in the delivery of thrombolysis to complex or developing myocardial infarctions. As a result, it is important that EDs continue to develop their thrombolysis pathways to ensure that the already high levels of service currently offered continue to improve.[12]

CONCLUSION

The changes to current guidance for PHT are appropriate and timely, and will increase the number of patients receiving prehospital treatment. Despite these changes a number of patients will still require treatment in hospital either because they self present, have atypical symptoms, or their initial ECG is either non-diagnostic or demonstrates complete heart block or left bundle branch block.

Authors' affiliations
N R Castle, Department of Emergency Medical Care and Rescue, Durban University of Technology, Durban, South Africa
R C Owen, M Hann, National Primary Care Research and Development Centre, University of Manchester, Manchester, UK

Competing interests: None.

Correspondence to: Mr Robert C Owen, 5th Floor, Williamson Building, University Of Manchester, Oxford Road Manchester, M139PL, UK; robert.owen@manchester.ac.uk

Accepted 9 August 2007

REFERENCES

1 **Department of Health**. *National service framework for coronary heart disease*. London: Department of Health, 2000.
2 **Castle N**, Owen R, Vincent R, *et al*. What percentages of patients are suitable for prehospital thrombolysis? *Emerg Med J* 2006;**23**:444–5.
3 **Joint Royal Colleges Ambulance Liaison Committee (JRCALC)**. *Pre-hospital guidelines 2004 Version 3.0*. Warwick, UK: University of Warwick, 2004.
4 **Weaver WD**, Eisenberg MS, Martin JS, *et al*. Myocardial Infarction Triage and Intervention project – phase 1: patient characteristics and feasibility of pre-hospital initiation of thrombolytic therapy. *J Am Coll Cardiol* 1990;**15**:925–31.
5 **Hans-Richard A**, Bossaert L, Gerasimos FS. European Resuscitation Council guidelines for resuscitation 2005: section 5 – initial management of acute coronary syndromes. *Resuscitation* 2005;**67S1**:S87–96.
6 **StataCorp**. *Stata statistical software: release 9*. College Station, Texas: StataCorp LP, 2005.
7 **SPSS Inc**. *SPSS: Release 15.0*. Chicago: SPSS Inc, 2006.
8 **Boersma E**, Maas AC, Deckers JW, *et al*. Early thrombolytic treatment in acute myocardial infarction: reappraisal of the golden hour. *Lancet* 1996;**348**:771–5.
9 **Widimsky P**, Budesinshy T, Vorac D, *et al*. Long distance transport for primary angioplasty vs immediate thrombolysis in acute myocardial infarction: PRAGUE 2. *Eur Heart J* 2003;**24**:94–104.
10 **Steg PG**, Bonnefoy E, Chabaud S, *et al*. Impact of time to treatment on mortality after prehospital fibrinolysis or primary angioplasty. *Circulation* 2003;**108**:2851–62.
11 **Armstrong PW**, WEST Steering Group. A comparison of pharmacologic therapy with/without timely coronary intervention vs. primary percutaneous intervention early after ST-elevation myocardial infarction: the WEST (Which Early ST-elevation myocardial infarction Therapy) study. *Eur Heart J* 2006;**27**:1900–7.
12 **Birkhead JS**, Walker L, Pearson M, *et al*, on behalf of the MINAP Steering Group. Improving care for patients with acute coronary syndromes: initial results from the National Audit of Myocardial Infarction Project (MINAP). *Heart* 2004;**90**:1004–9.